dence that many similar customs must have originated independently in regions far apart. Among many other phenomena, the author traces the occurrence of masks among various peoples, and shows that they occur all over the world, in America as well as in Australia and all parts of the Old World. It seems that the games in which our children delight are well-nigh universal. The children of the ancient Egyptians played tag; they had balls and dolls. Bodies of dolls were made of wood, and might be mistaken for modern fabrics. Undoubtedly they were dressed by the Egyptian girls, as our girls nowadays enjoy dressing their dolls. There were even movable ones, the hands and feet of which could be moved by means of strings. Others, made of painted wood, were very imperfect in form, and had strings of beads instead of hair. In the museum of Leyden there is an ancient toy that looks as though it had been bought at a Christmas fair. There were figures of animals with movable mouths, and balls of leather. Among Greek and Roman antiquities, dolls made of wood or clay, and others of wax and ivory, are found. Dolls' houses with lead furniture; the saving-box with a slit on top; toy cows, horses, and hogs, — were known to the children of ancient Rome, as they are to our own. From this evidence it might be supposed that our dolls are "descendants" of the ancient dolls; but it must be remembered that there is hardly any people that does not have them. Their use is so general, and so natural to the child, that even the laws of Mohammedanism are disregarded by the childish desire. The Koran forbids representations of human beings, and still the Mohammedan child plays with its doll. The women of Bagdad believe that a doll may eventually come to life, and harm their children, and therefore prevent their use. The girls, however, play with cushions and pieces of wood instead, which they nurse and dress. In Siberia and arctic America ivory dolls, clothed in furs, of beautiful workmanship, are found; in Peruvian graves, dressed dolls of clay are found; and in Africa the girls play with wooden or clay figures. In this way Andree traces numerous ethnological phenomena in their distribution among various peoples, and shows that the human mind everywhere develops on the same lines, and that a migration of inventions must be supposed only in such cases where its existence can be proved by historical facts.

ELECTRICAL NEWS.

Ether, Electricity, and Ponderable Matter.

SIR WILLIAM THOMSON'S presidential address before the English Institute of Electrical Engineers was looked forward to with some eagerness by electricians. The title given above is fascinating, and promises solutions of questions which have been asked for so many years, and whose answer had seemed so hopeless. We think that the address is disappointing. It tells us little that we did not know, and, although suggestive, it hardly points out how to follow the suggestions.

After a few introductory remarks, Sir William dwelt briefly on the necessity of an electrician being also an engineer. He would give a youth desiring to take up the study of electrical engineering a good deal of chemistry, of mathematics, and of dynamics. "I am perfectly sure, that, if the youth is qualified in other departments, the mere addition of electricity to the education of a competent engineer will not take such a long time as might be imagined, and that the merely educational part of the work will not be protracted unduly by adding electricity to the branches learnt in general engineering."

Passing to the main subject of his address, Sir William spoke of the demand that was every year growing in intensity, for something like a mechanical explanation of electrical phenomena: "to know something of the internal relations connected with the wonderful manifestations of force and energy which are put before us in the action of the magnet, in the working even of a common electrical machine, and in electro-magnetic phenomena." The question of the transmission of messages through cables was then taken up at some length, and the history of the theory on which the first Atlantic cable was constructed was given. Sir William then spoke of the two effects which must be considered when an electrical wave is transmitted, — that due to static induction, and that due to magnetic induction. In the first solution of the problem, only the statical effects were considered, since the propagation was so slow that they were large compared with the magnetic effects; but Mr. Heaviside has lately shown that the magnetic induction is really an advantage in signalling or in transmitting speech by telephones, since it makes the dying-out effects much more uniform. If only static induction were considered, the waves of short period would die out more quickly than those of greater length. The magnetic induction helps to make this difference less, and is therefore beneficial.

Taking up the subject of alternating electric currents in wires, the speaker gave some figures on the increase in the resistance of a wire carrying alternating currents as compared with the resistance of the same wire for continuous currents. It has become well known in the last few years that the distribution of a varying current in a wire is not uniform, but the density is greatest near the outside. This has the effect of increasing the resistance: for instance, taking a period of 80 reversals per second, the increase in resistance of a wire 1 centimetre in diameter is not so much as .01 per cent; for a diameter of 1.5 centimetres the increase is 2.5 per cent; for 2 centimetres it is 8 per cent; for 4 centimetres, 68 per cent. For periods of twice the frequency we must multiply by $\sqrt{2}$. The inward penetration of the current into the wire may be compared to the motion of water in a long tube, when the tube is moved backward and forward in the direction of the axis. To represent the case of alternating currents in parallel wires, Sir William would replace the wires by densities of fluid in direct proportion to the electric conductivities, the space around being a fluid without mass, the cylinders of dense matter rotating periodically in opposite directions. To represent the electro-static effect in such a case, "imagine an interface between the two fluids, and give it such stiffness against change of shape as is required to cause it to fulfil the conditions which electro-static knowledge, and our knowledge of the laws of electric and electro-magnetic influence, dictate to us."

Sir William then went on to say that he believed that an electric current actually caused a rotation of the ether, and considered the case of a copper core surrounded by a helix. Induced currents were set up in the copper, and the only action conceivable in the space between the coil and the core was a rotation. This might be either a continuous rotation, or a rotation through an angle proportional to the strength of the current. In iron, however, something quite different must take place. If the fluid whose rotation caused the observed effects moved around continuously, there would be no shearing. If, on the other hand, there were only a drag upon the ether through a certain angle, then there must be a force resisting steady rotation; that is to say, there would have to be an arrangement of such character that a constant torque would produce a constant instead of an accelerated rotation. It would appear that such an effect could only be produced by an inherent rotation of the molecules. To represent a medium of this kind, Sir William imagines a space divided up into a number of small squares, with their sides fixed together by rubber bands. In each a gyrostat in the form of a rotating molecule is placed. Such a medium, without the gyrostats, would represent a perfect fluid; but, with the gyrostats in place, turning could only take place by stretching the elastic bands, which would require a constant force. On this hypothesis, we must suppose that the ether is less rigid in iron than in other metals, and has the same rigidity for all non-magnetic substances. But no model that can be imagined can represent the electro-static as well as the magnetic effects. In concluding, Sir William pointed out that even the very imperfect attempts at a mechanical explanation of electrical phenomena which he had indicated would only apply to a very small part of the subject; and the tremendous difficulties in the way of a complete mechanical explanation prevented him from hoping to see the question solved in his own lifetime, though he felt confident that a solution would be found, and that what appeared so insuperable a mystery to us would be no mystery at all to future generations.

AN ELECTRIC DATE STAMP. — According to *Engineering*, the Electric Date and Time Stamp Company are introducing a new stamp, which at one operation marks on any document the minute, hour, day, month, and year, as well as the usual address and business of the proprietor. Unlike many automatic appliances which are dubbed electrical merely for the purpose of imposing on un-

wary customers, the electric current is really employed in this piece of apparatus. The device consists of five type-wheels with connecting gear, disposed on a single axis; and the minute, the hour, the day, the month, and the year are correctly placed in line under the impression-pad. The minute-wheel is actuated by any clock, through the instrumentality of an electric current, which shifts it round minute by minute, a pawl carrying round the hour-wheel when sixty movements have been made. The apparatus is under trial at the London General Post-Office for dating telegrams.

THE PRODUCTION OF ELECTRIC CURRENTS BY MECHANICAL ACTIONS. — The following interesting experiment is due to M. Siljestroem. Two hollow iron cylinders were closed at one end by the same plate of german silver, and were plunged in ice. They were connected with a galvanometer, and, when the air in one of them was compressed to 86 atmospheres, a current was observed which was in the opposite direction to that which would be produced by an elevation of temperature, although there was a momentary current in the same direction as the latter.

EDISON ILLUMINATING COMPANIES. — The development of the electric-light business is well shown in the holding in Kansas City, on Feb. 12–13, of the semi-annual convention of the Association of Edison Illuminating Companies, a full report of which appears in the *Electrical Review*. The Edison meetings of this kind have invariably been for "business." The policy of President John I. Beggs has always been to hold the convention closely to its work up to the final adjournment, leaving the question of recreation as a secondary consideration. The convention, while not as large as on former occasions in the number of delegates in attendance, was one of absorbing interest, the papers were more numerous and comprehensive than at previous meetings, and there was nothing lacking in the discussions of the vital features of the business with the exception of the unavoidable absence of Mr. Edison and President Johnson, of the Light Company. It was but natural that a sense of exultation at the prospect of speedy results in the fight for the supremacy (which, if the patent laws of the United States mean any thing, are now near at hand) should be evident in all the utterances of the discussions. The cloud of uncertainty which long litigation always brings seemed to be lifted, and a tone of assurance and expectancy was one of the marked features of the session. A paper was read by J. H. Vail, general superintendent of the Edison Electric Light Company, on electric railways and their relations to Edison central stations, illustrating by statistics the advantages to be derived from their operation by Edison illuminating companies. A detailed statement was made by J. H. McClement, comptroller of the parent company, on the progress of the patent litigation. This was supplemented in the evening by a stereopticon entertainment arranged by W. J. Jenks, director of the Standardizing Bureau, showing in a series of slides the history of Mr. Edison's work. An interesting discussion of the results of the use of the Edison chemical meter brought out a paper of great practical interest by E. A. Kennelly of the Edison laboratory, under whose direct supervision experiments have been conducted the past year. The meter has been cheapened both in first cost and expense of maintenance, and samples of new types are now being made for the Paris Exposition. The possible errors, never large under reasonable management, have practically disappeared. A paper on the "Commercial Mean of the Incandescent Lamp," by Mr. Edison, was read by Mr. Upton of the Edison Lamp Company. This set forth in amplified form the practical results of the operation of the laws regarding lamp efficiency brought out some time ago by John W. Howell. It also detailed some interesting facts as to lamp breakage in central stations. The discussions developed the fact that one result of Mr. Edison's experimental work has been to secure fifty per cent more light from the same energy expended, while fully maintaining the guaranteed life of lamps, as a matter of actual record. The other papers were on "Medical Applications of Current from Central Stations," by J. W. Parcell, jun., of the Sprague Electric Railway and Motor Company; "The Steam-Engine," by Professor William D. Marks of Philadelphia; "Inspections," by W. J. Jenks. The executive committee reported in favor of holding the next meeting at Niagara Falls.

NOTES AND NEWS.

IT is announced that Great Britain, France, Germany, Spain, Italy, Denmark, the Netherlands, Norway and Sweden, Brazil, Uruguay, Chili, Japan, and the Sandwich Islands have signified their intention of sending representatives to the International Conference which is shortly to be held to consider some means of signalling at sea that will render collisions less liable to occur than under the present system. The proposed conference is the result of a letter addressed to the different maritime powers of the world by the President of the United States, asking their co-operation in this matter. The date and place for holding the meeting yet remain to be fixed.

— Russia's boldness in pushing on her railway system across the Turcoman region to Central Asia has received its due reward. Already the line is declared to be paying its working expenses; and Gen. Annenkoff, the designer, has been encouraged thereby to ask permission of the Emperor to extend the line still farther to Tashkent. In all probability, the request, according to *Engineering*, will be acceded to, because Tashkent, besides being the administrative centre of the province of Turkestan, is a town with a population of 100,000 people, and the extension of the Samarcand section thither would not only tie an important political and trading centre to the Russian railway system, but also link the Syr Daria River and the Aral communications with those of the Caspian. The Aral fleet, as originally established, used to ply on the Syr Daria River, along the banks of which the Russians marched, and founded a series of forts and colonies, in their advance upon Tashkent and Samarcand. The great drawback the steamers had always to contend with was the absence of any fuel except a kind of brierwood known as saxaul. If the Samarcand line were extended to Tashkent, it would cross the navigable head of the river on its way, and be able to provide the steamers with liquid fuel from the Caspian, similar to the supply the railway was able to accord to those on the Oxus when it penetrated to that river a year ago. North of Tashkent stretches a series of steppes, adjoining those of Siberia, which are being gradually settled by colonists from Russia. This region, which is well adapted for agricultural and pastoral pursuits, would benefit considerably by the extension of the railway to Tashkent; so that Gen. Annenkoff has many cogent reasons, besides those of a military character, to adduce in support of his project. It is curious to contrast this activity of the Russians with the lethargy of English authorities in regard to the Indian frontier communications. If the completion of the Quetta line to Candahar would not pay the whole working expenses of the railway from the Indus, it would at least more than pay that on the extension, while adding immeasurably to the security of the Indian Empire. In Burmah again, where Gen. Sir Frederick Roberts, four years ago, urged upon the government the rapid construction of railways as a means of pacifying the country, no important lines, except the slow-paced Tounghoo-Mandalay line, have been taken in hand, and money is being wasted in punitive expeditions against dacoits and tribesmen, which would have been far more advantageously spent on railway-works.

— For paving streets, India-rubber threatens to enter into competition with asphalt. This new pavement, according to the *Engineering and Building Record*, is the invention of Herr Busse of Linden, Prussia, who has introduced it in Hanover. He used it first in the summer of 1887 for paving the Goethe Bridge, which has a surface of about 1,000 square metres, or 10,764 square feet. The new pavement, it is stated, proved so satisfactory that 1,500 square metres (16,146 square feet) of ordinary carriage-way in the city were paved with it last summer. The Berlin corporation, being favorably impressed with the new pavement, has had a large area paved with India-rubber as an experiment, and the magistracy of Hamburg is likewise trying the pavement. It is asserted that the new pavement combines the elasticity of India-rubber with the resistance of granite. It is said to be perfectly noiseless, and unaffected either by heat or cold. It is not so slippery as asphalt, and is more durable than the latter. As a covering for bridges, it ought to prove excellent, as it reduces vibration; but a question may be asked as to its cost. The expense must be heavier than that of any known pavement.